



**Montana Fish,
Wildlife & Parks**

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Ravalli County Commissioners

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11/20/07

Jim Rokosch, Chair
Ravalli County Commission
215 South 4th St.
Hamilton, MT 59840

Dear Jim:

Attached are some photographs and descriptions of various situations along streams in Ravalli County. Each of these is characterized by either a home near or alteration of vegetation near a stream. As you consider interim stream setback regulations, I am sure you realize that most streamchannels will change with time. Streams in valley bottoms, where most homesite development occurs, tend to migrate laterally and accumulate gravel and debris that can lead homeowners to alter the natural stream processes.

I have also enclosed some related articles:

1. A peer-reviewed article that I co-authored with two other biologists regarding the impacts of rip rap on salmonids (trout and salmon). For streams to function naturally, we should do all we can to avoid artificial streambank stabilization. Once homes are built near a stream, the likelihood of future streambank stabilization increases.
2. The cover page and selected pages from an inventory of streambank stabilization projects in Missoula County. The Bitterroot River in Missoula County was part of the inventory. While the authors did not survey the river in Ravalli County, they did comment that the bank stabilization projects in the Missoula County reach often coincide with residential development. My observations over the years have also been that streambank stabilization is very often, but not always, associated with homesite development.
3. The cover page and selected pages from a Montana Department of Transportation study of the Bitterroot River in Ravalli County. Among other things, the authors surveyed streambanks of the Bitterroot River in Ravalli County. They calculated that 77935 feet of streambank were stabilized on this reach of River. The "vast majority" of the armored banks are associated with private residences (Table 3). It is unclear how the study differentiated streambank stabilization for residences and bare land.

If you have any questions regarding these materials, please contact me at 363-7169. Thank you for your attention to this important issue.

Sincerely,

Christopher G. Clancy
Fisheries Biologist

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Ravalli County Stream Setbacks

The following photographs illustrate a variety of situations along streams in Ravalli County. The gray rectangles in some of the photos are intended to disguise individual homes. Homes in these pictures vary from new to those established many years ago. Pages 1-10 illustrate recent situations often involving streamchannel changes. The situations on pages 11-17 are not from situations as recent as the previous pictures, but they illustrate issues associated with development near streams. Homes that were built many years ago, that have recently had problems, illustrate that streams do change over time and building more homes near streams will only add to these problems.

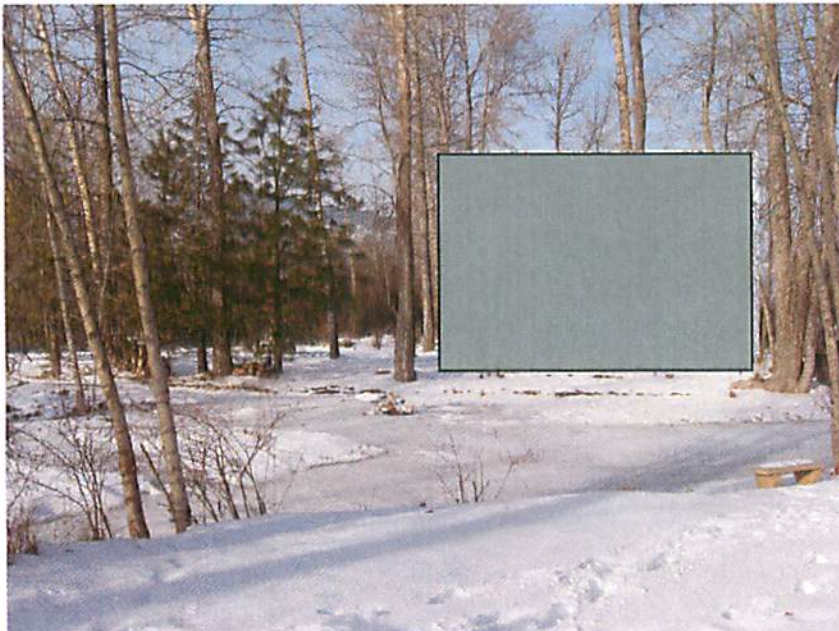
This is not a complete documentation of these types of situations. It is a subset of circumstances that I have seen. I usually do not have a camera with me, but I am familiar with quite a few similar situations for which I have no pictures. I have used Google Earth to show a few situations on the river.



Blodgett Creek (Spring 06) – Note eroding bank – homeowner feared undercutting bank would jeopardize patio and house. He was issued a 310 permit to stabilize bank.



Bitterroot River – downstream of Lost Horse Creek (Spring 07?) – Home moved to site and streambank eroding. Note new streambank stabilization.



Sweeney Creek (2007) – Creek in foreground – 2 landowners received 310 permit to alleviate flooding and streamchannel migration concerns by hauling out bedload deposition in the creek.

Chaffin Creek (2007) – Creek had to be bulldozed into single channel to alleviate flooding and lateral stream migration



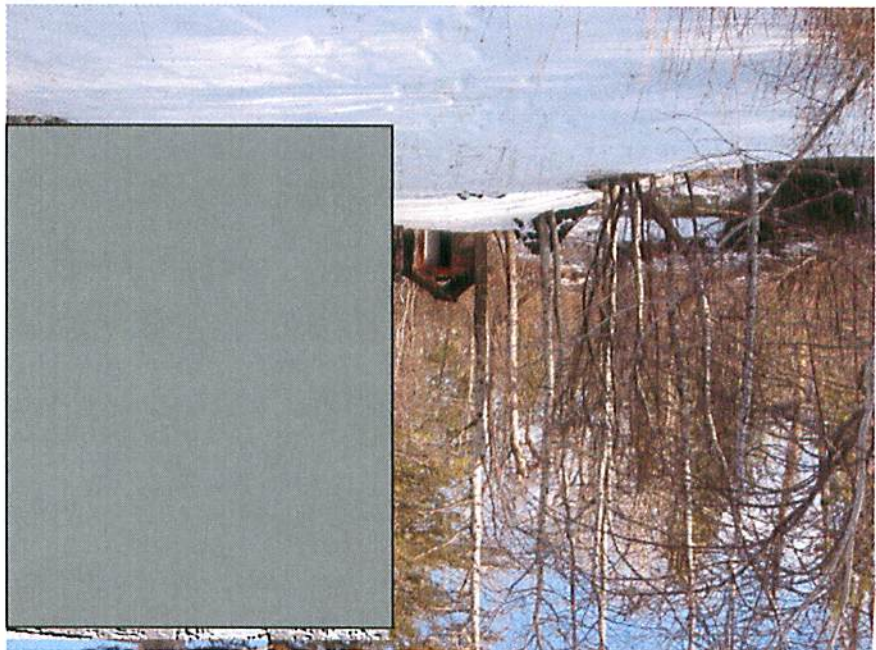
Skalkaho Creek (2007) near BRID siphon – foundation at edge of trees – I assume construction is taking place at this site



Tincup Creek (2007) - lateral movement jeopardizing pond on right. Owner bulldozed creek to keep it away from pond. Additional bulldozing downstream where lateral creek migration near structure concerns homeowner.



Chaffin Creek – same site as above – home and lawn close to creek.



Little Sleeping Child Creek (2007) – pad formed near creek (Creek in culvert).

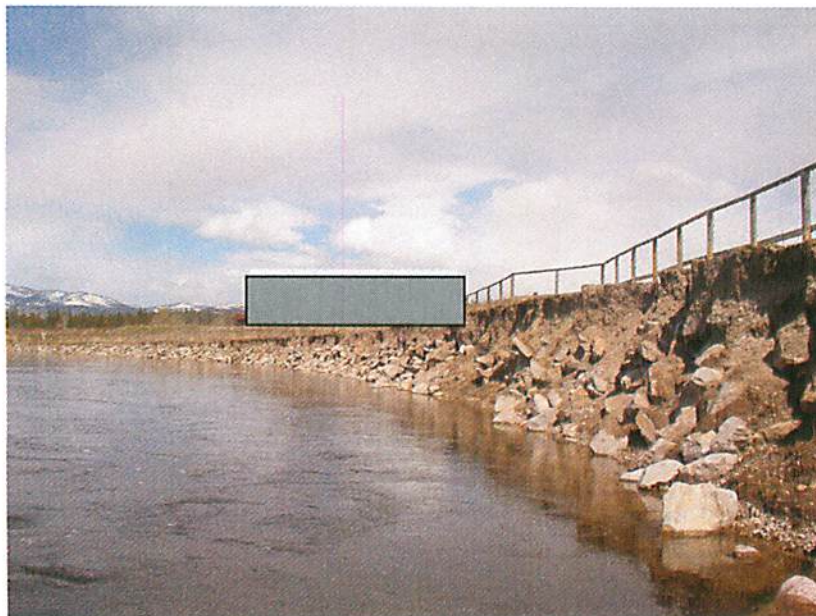


Fred Burr Creek (2007) – lateral stream migration nearly undercuts home (shed fell in). Homeowner issued permit for significant project to move creek away from home.

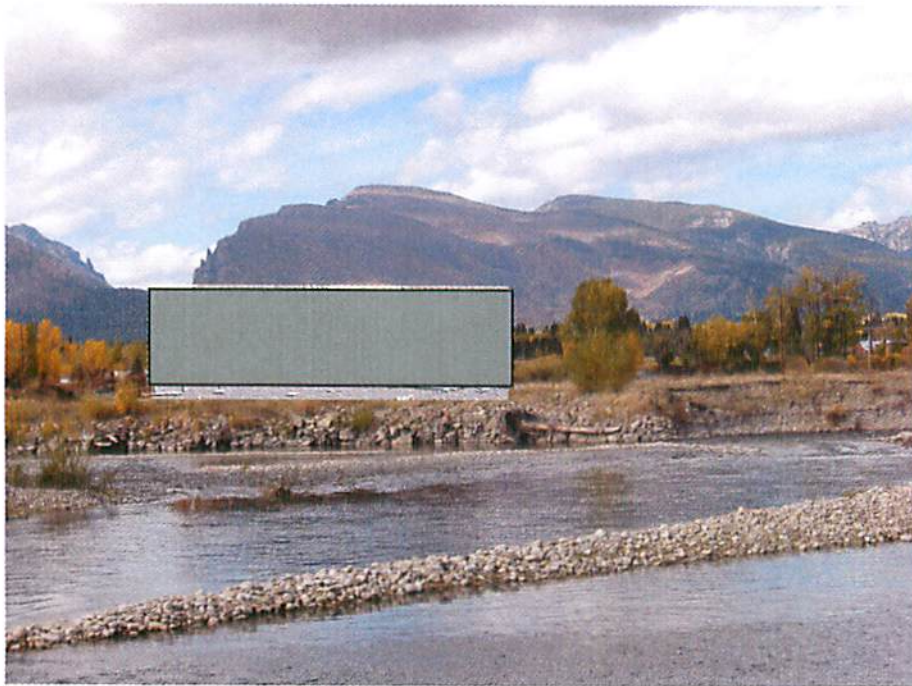




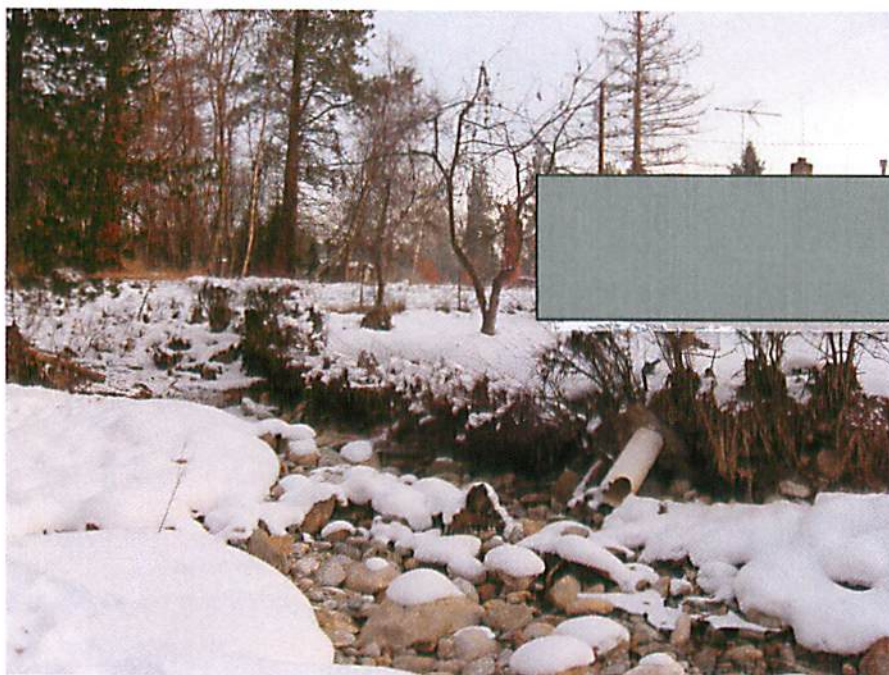
West Fork Bitterroot River (2007) – Foundation between Nez Perce Road and Nez Perce Fork



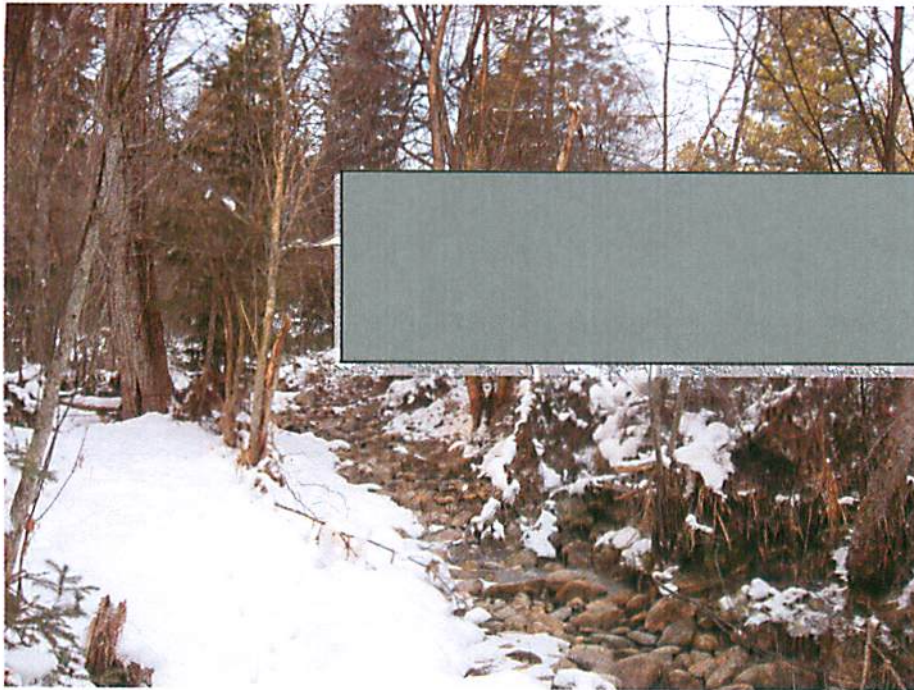
Bitterroot River (2007?, photo given to me)– south of Florence – recent subdivision where developer filled trench back away from streambank with rip rap and river migrated into trench area.



Bitterroot River (2007)– upstream from Woodside – Home under const in 2005-2006 – old rip rap project on streambank (note eroding bank on downstream end, which jeopardizes the stability of the rip rap)



Kootenai Creek (2007)– home on right in jeopardy of streamchannel migration. Homeowner went upstream with excavator and channelized creek on neighbors property to save home. Later was issued permit to alleviate problems for upstream landowner.

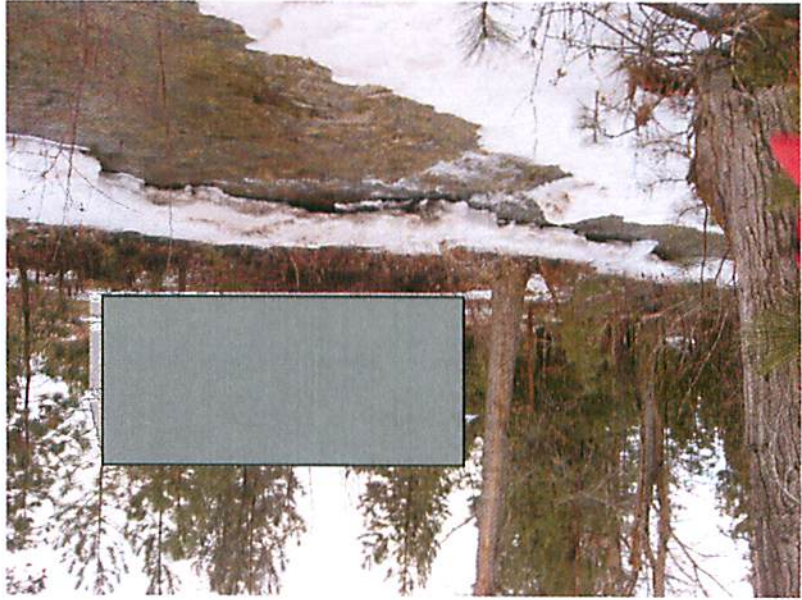


Kootenai Creek (2007 photo)– upstream of previous picture – building near channel that large portion of creek was moving into.



East Fork Bitterroot River (Fall, 2007)– several miles upstream of Sula – house on left under construction. Cabin on right applied to rip rap streambank a few years ago.

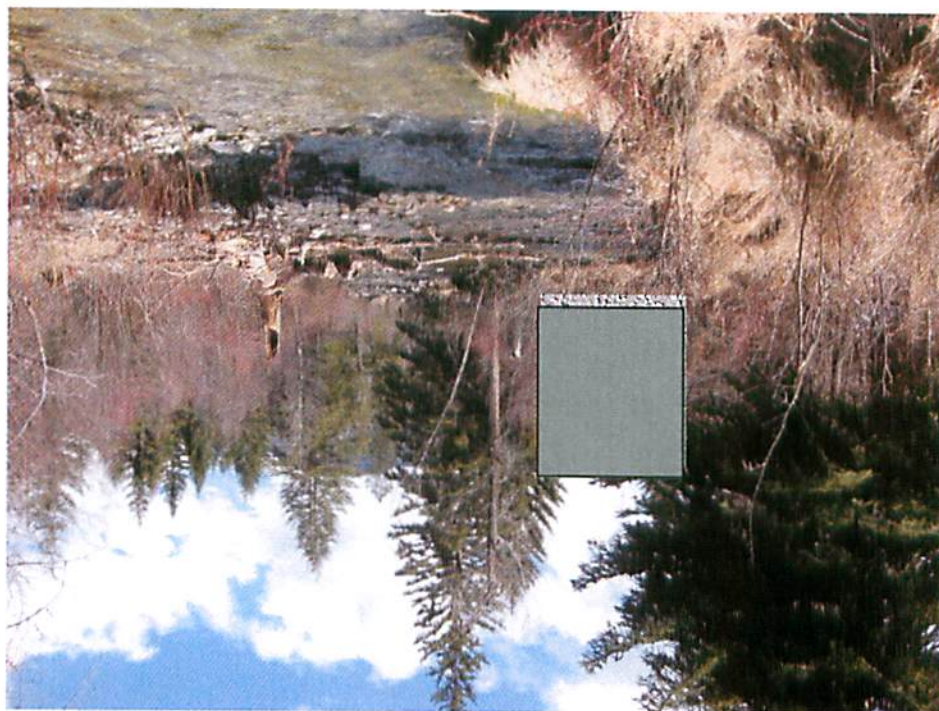
Mill Creek near Dutch Hill (2006?) – Home close to Creek – homeowner across and downstream issued permit to rip rap to protect building on property.



Burnt Fork Bitterroot (Fall 2007) – lawn adjacent to stream – homeowner issued a permit to stabilize streambank. Shallow roots of lawn grass are easily undercut by stream processes.



Bear Creek – Note the roof of the new house construction in center left of picture. Picture taken from property of downstream landowner. Have not been onsite of the home, but it is close to the creek.



The following photos illustrate various situations along streams in Ravalli County. There is nothing unusual about these homes. They were built several to many years ago and are used for illustrative purposes.

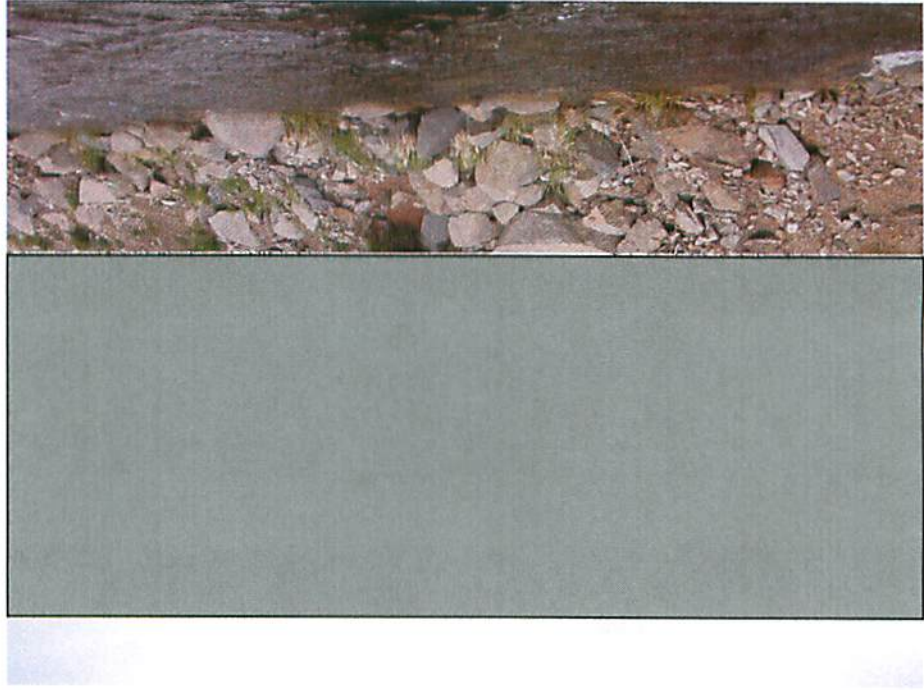


Sweathouse Creek – aerial view of lawn development near and along creek. Note home in center left, next to creek..

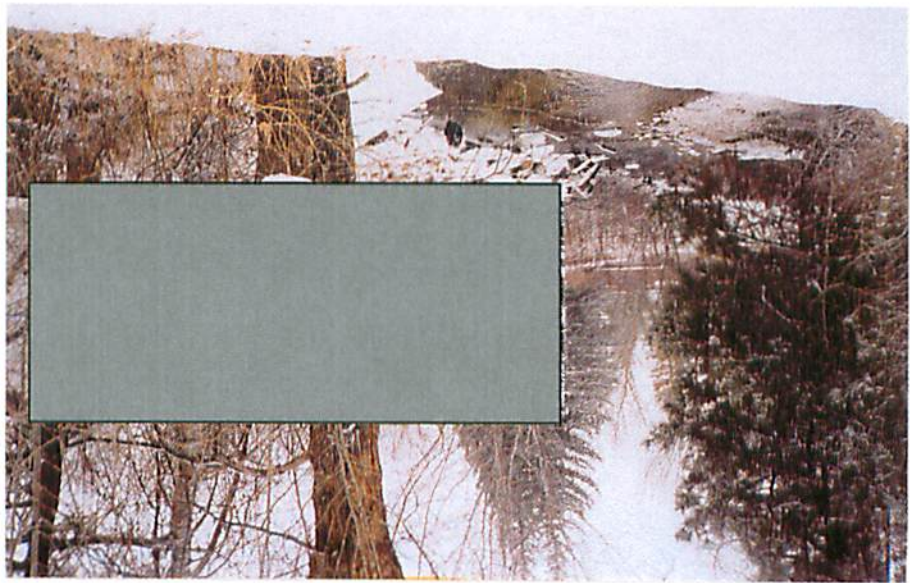


Sweathouse Creek – same area as above. Lawn grasses have shallow root system. Rip rap required to stabilize streambank.

East Fork Bitterroot River – undated – photo given to me. Note rip rap on streambank.



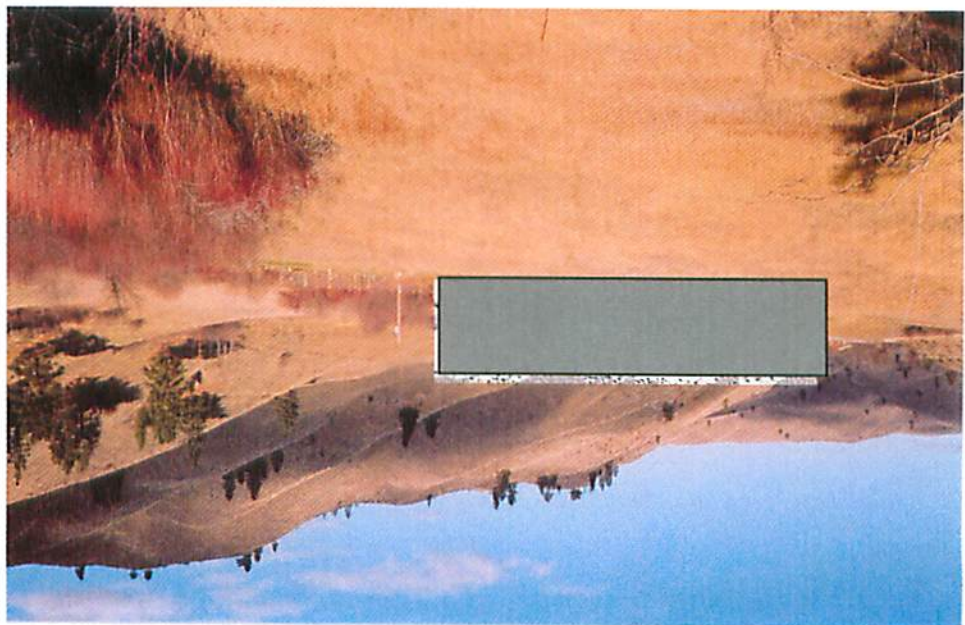
North Bear Creek (2007 photo) – Home near streambank (has been there many years).



Sweathouse Creek (2007)– Home back from creek, lawn close to creek

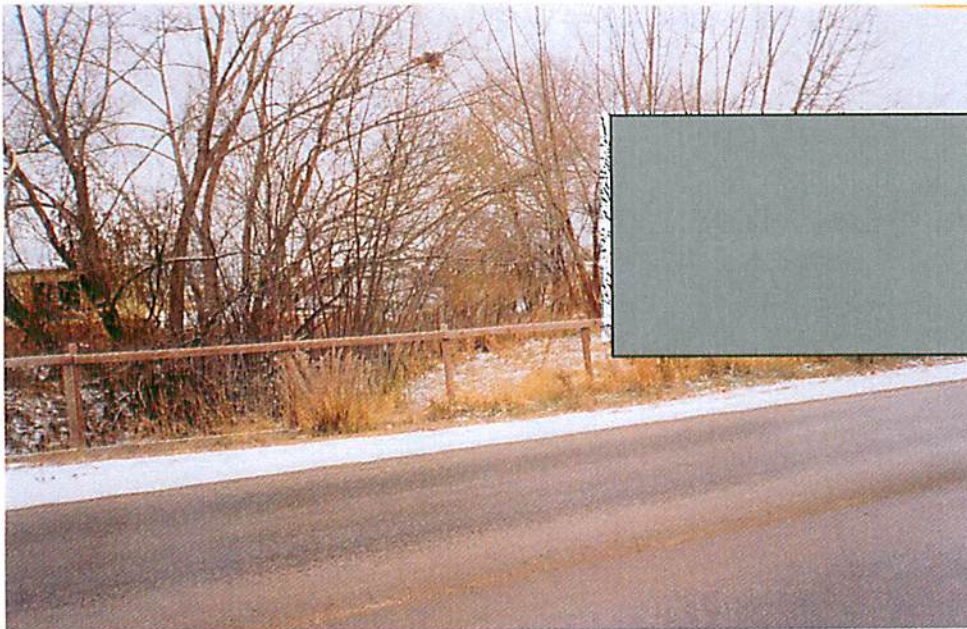


Little Sleeping Creek (2005 photo)– Home away from creek but development close to creek.





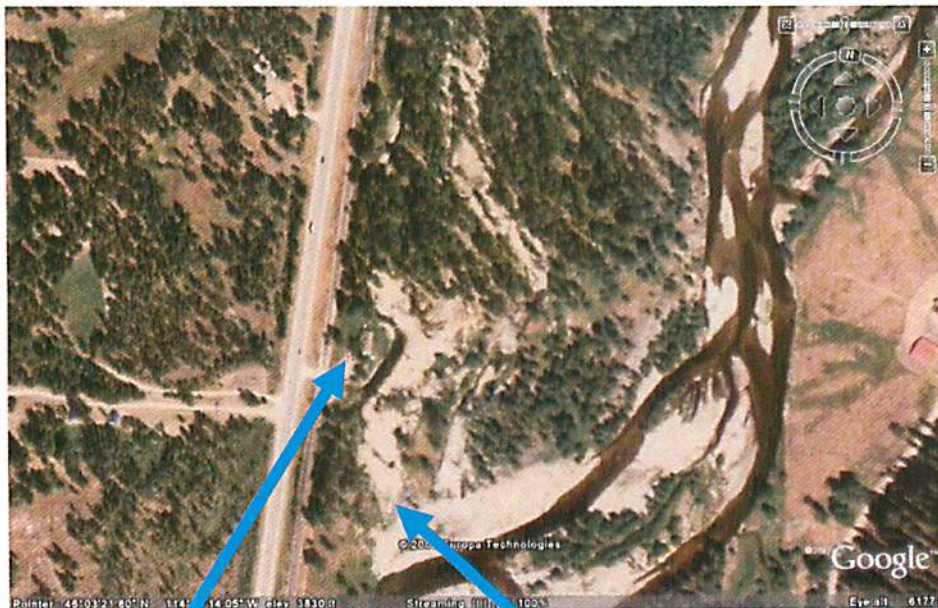
Willow Creek (2007 photo)– Older home near creek.



Willow Creek – (2007 photo) across highway from previous site. Creek undercutting patio.



Bitterroot River near Bell Crossing – streambank rip rapped near this home while under construction several years ago. The River migrated to the east a long distance during construction and threatened the home.



Homesite

Dike

Bitterroot River – The dike was constructed to keep the river from changing channel and flooding homes north of Darby. The labelled homesite has flooded in the past and homeowners to the north are concerned about flooding and streamchannel migration. Floodplain regulations should prevent this type of flooding, but do not prevent problems caused by streamchannel migration as illustrated below.



Bitterroot River – south of Florence. Home in center of picture is on a high bank but river was eroding it so the homeowner paid for streambank stabilization about 3 years ago. Straight streambank just north of home is the stabilized reach.



West Fork Bitterroot River near Conner – The home is on a high bank, not in the floodplain, but the river was laterally migrating and eroding the toe. Homeowner paid for streambank stabilization and recontouring of the slope about 10 years ago.



Bitterroot River (West Tucker Fishing Access Site in center of picture) – Not a homesite, but illustrates the difficulty of dealing with laterally migrating Bitterroot River. The streambank of this popular fishing access site has been stabilized twice with rootwads that failed. The third treatment was rip rap that needs maintenance or it may fail..



West Fork Bitterroot River – This home was built near the streambank and subsequently a bank stabilization project was permitted to stop lateral stream migration

Inventory and Assessment of Bank
Stabilization Projects on Reaches of the
Clark Fork River, Bitterroot River,
Blackfoot River, Lolo Creek, and Nine
Mile Creek in Missoula County, Montana

The Watershed Education Network

**Inventory and Assessment of Bank Stabilization Projects on Reaches of the Clark Fork River,
Bitterroot River, Blackfoot River, Lolo Creek, and Nine Mile Creek in Missoula County, Montana.**

**Troy M. Brandt
Erik Ringelberg**

The Watershed Education Network in cooperation with Missoula Office of Planning and Grants.

*The Watershed Education Network is a 501c3 non-profit education and research organization
dedicated to advancing the understanding of watershed issues.*

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Abstract- To assess the number of bank stabilization projects on five Missoula County watercourses, bank stabilization structures were field evaluated and inventoried during the summer of 1999. Bank stabilization is commonly used for protecting roadways, railroad grades, and residential development. Project data describing 215 bank stabilization projects were collected over the 118 river miles comprising the study area. Bank projects stabilized a total of 29 river miles and varied by age, material, size, project need, and adjacent landuse. Data collected were organized in a database to be used by the Missoula County floodplain manager. The manager will use this tool and other information to educate landowners concerning the hazards of floodplain development. Bank stabilization was observed to influence some river reaches depending on project size and location. Further research should investigate the cumulative effects of bank stabilization on fluvial and biological processes.

not appear to be threatened by high frequency floods. Low frequency floods and downstream ice jams are problematic for homes built in proximity to the river. The lower reach is affected by multiple highway intrusions, the Stimson mill facility, and residential development.

Bitterroot River: Missoula County Line (Chief Looking Glass Access) to the Clark Fork River Confluence (Kelly Island Accesses-Spurgin Road)

Table 5: Project totals for the Bitterroot River surveyed between the Missoula County line and the Lolo levee and the Lolo levee and the Clark Fork River.

<i>Watercourse</i>	<i>Sampled Reach</i>	<i>Projects</i>	<i>Ave Project</i>	<i>Max Project</i>	<i>Total Projects</i>	<i>River Miles</i>	<i>Survey Length</i>	<i>Percent Stabilized</i>
Bitterroot River	Missoula County Line to Lolo Levee	6	493 ft	804 ft	2,958 ft	47,280 ft	94,560 ft	3%
	Lolo Levee to Clark Fork River	22	1,007 ft	4,800 ft	22,160 ft	61,480 ft	122,960 ft	18%
	Total	28	897 ft	4,800 ft	4.8 miles	20.6 miles	41.3 miles	12%

* Ave Project, Max Project, and Total Projects refer to surveyed project lengths.

The river miles totaled 20.6 miles. Twenty-eight bank stabilization projects totaled 4.8 miles in length (Table 5) and accounted for 12% of the survey length. Unlike the Blackfoot River, a broad alluvial valley with little influence from bedrock outcroppings characterizes the central and lower Bitterroot River. The portion of the Bitterroot River within Missoula County was partitioned into two sections according to the extent of residential development (Figures 6 and 7). Sectioned at the extensive Lolo levee, the upstream 9 miles of river are characterized by numerous channels that meander across the low gradient floodplain (3% of the channel is stabilized). The few bank projects found in this reach coincide with residential development (aerial photos 8-5 to 8-7).

Approaching Lolo, the river changes from a braided to a single thread channel. The valley constricts to limit the floodplain as the river flows against the eastern valley margin (aerial photo 8-11).

Around Lolo Creek there is an increase in both residential development and bank stabilization projects. An extensive levee framing the western channel and blanket riprap along the eastern bank protect residential developments. The western portion of the floodplain has been filled to increase the floodplain elevation necessary for development. Downstream of the Lolo area, five sporadic projects (aerial photo 6-3) protect undeveloped floodplain. The Montana Rail Link railroad bed is the dominating bank stabilizing project in this reach (2,300 ft in length).

Montana Department of Transportation- Stream Mitigation Study Bitterroot River Ravalli County, Montana

Draft

April 21, 2003

Prepared for:

Montana Department of Transportation
2701 Prospect Avenue
PO Box 201001
Helena, MT 59620-1001

Prepared by:

Inter-Fluve, Inc.
25 North Willson, Suite 5
Bozeman, MT 59715
(406) 586-6926
Fax (406) 586-8445

in Figure 3. Severely eroding banks increase in the uppermost project reach near Darby (RM 83 to 69); and between Woodside and Bell Crossing (RM 52 to 41). Figure 3. suggests that these sub-reaches are the most unstable segments of the project reach. Subsequently, the upper project reach is heavily armored with 'private' bank protection between RM 83 and 74; and significant spans of riprap protecting Rail/MDT and Secondary Roads between RM 72-69 (Figure 4A). As illustrated in Figure 4B, significant lengths of bank protection are located above and below bridge structures. However, a vast majority of the armored banks are associated with private residences as well as riprap segments that protect the road embankment and bridges. Total bank protection in linear feet by responsible party on the main stem Bitterroot River: south of Darby (Rye Creek confluence) to the Ravalli/Missoula County line is presented below in Table 3. Total cumulative bank protection on the Bitterroot River is shown in Figure 5.

Table 3. Total bank protection in linear feet by responsible party.

Responsible Party/Owner	Left Bank		Right Bank		Left and Right Bank	
	Total (ft)	Percent %	Total (ft)	Percent %	Total (ft)	Percent %
Private	24184	56	29545	85	53729	69
MDOT	5209	12	2693	8	7903	10
Rail/MDOT	7552	18	0	0	7552	10
Railroad	4559	11	1359	4	5918	8
Secondary Rd	1479	3	1354	4	2833	4
Total	42984	100	34951	100	77935	100

Field data collection included a comprehensive inventory of point data. The distribution of irrigation diversion structures through the project reach is presented in Figure 6. A total of 17 structures were observed in the field. One of the largest irrigation diversion structures serves the Republican Ditch at RM 65.5, immediately below the confluence with Sleeping Child Creek. The diversion is about a 12- foot drop constructed from large concrete and boulders. The backwater above the diversion has resulted in substantial aggradation of fines, which appear to be derived and deposited by Sleeping Child Creek sub-watershed. Other major diversion structures include Hedge Ditch (RM 69.5) and Woodside Ditch (RM 55.8) immediately downstream of Silver Bridge.

The distribution and extent of large woody debris (LWD) throughout the project reach is presented in Figure 7. Large woody debris is most prevalent throughout the valley center (Victor section) between RM 56-36, which corresponds with the most wide floodplain area, a high meander belt width, and a network of multiple braiding and anastomosing channels.

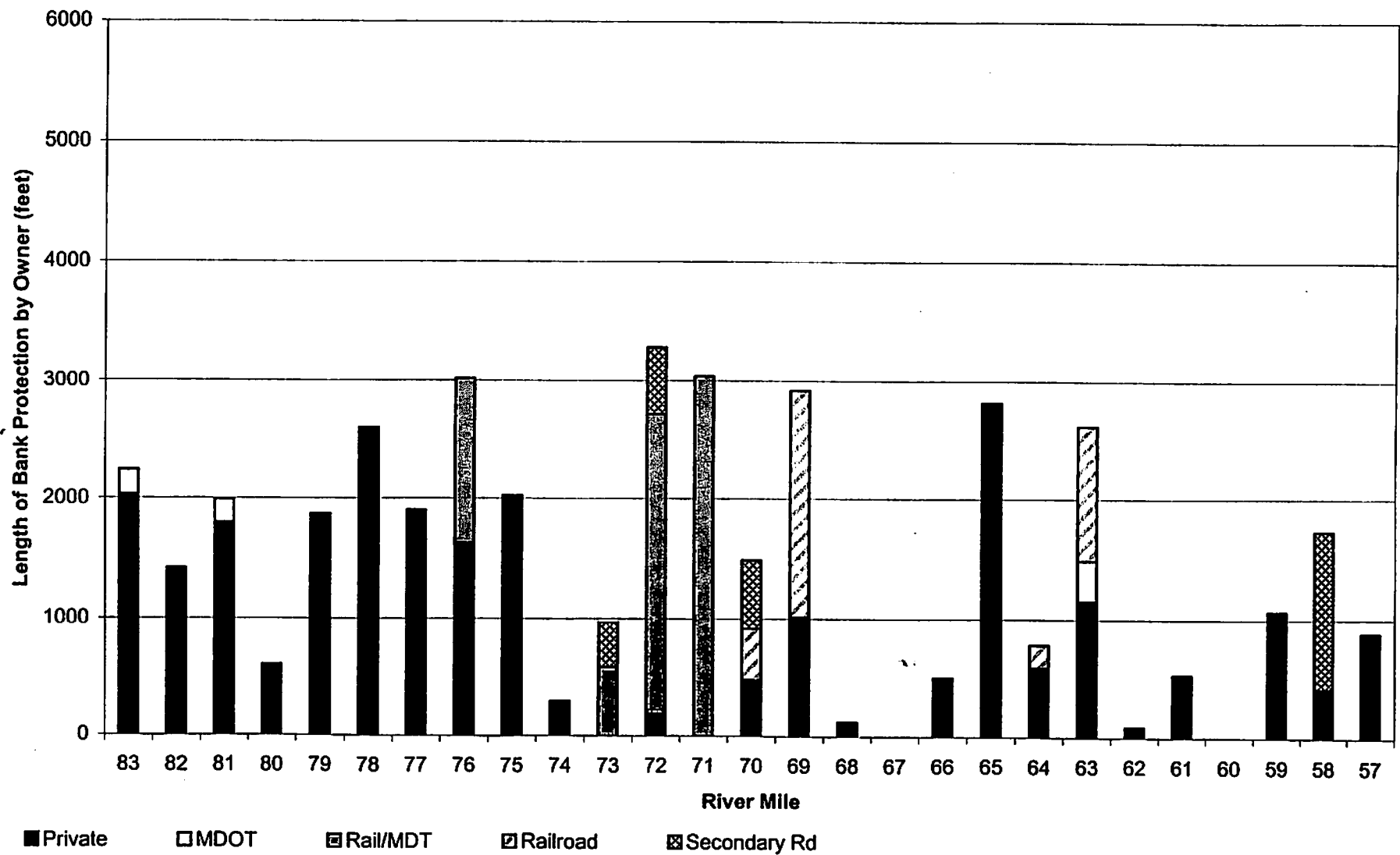


Figure 4A. Total inventory and relative distribution of bank protection along the main stem of the Bitterroot River, categorized by responsible party.

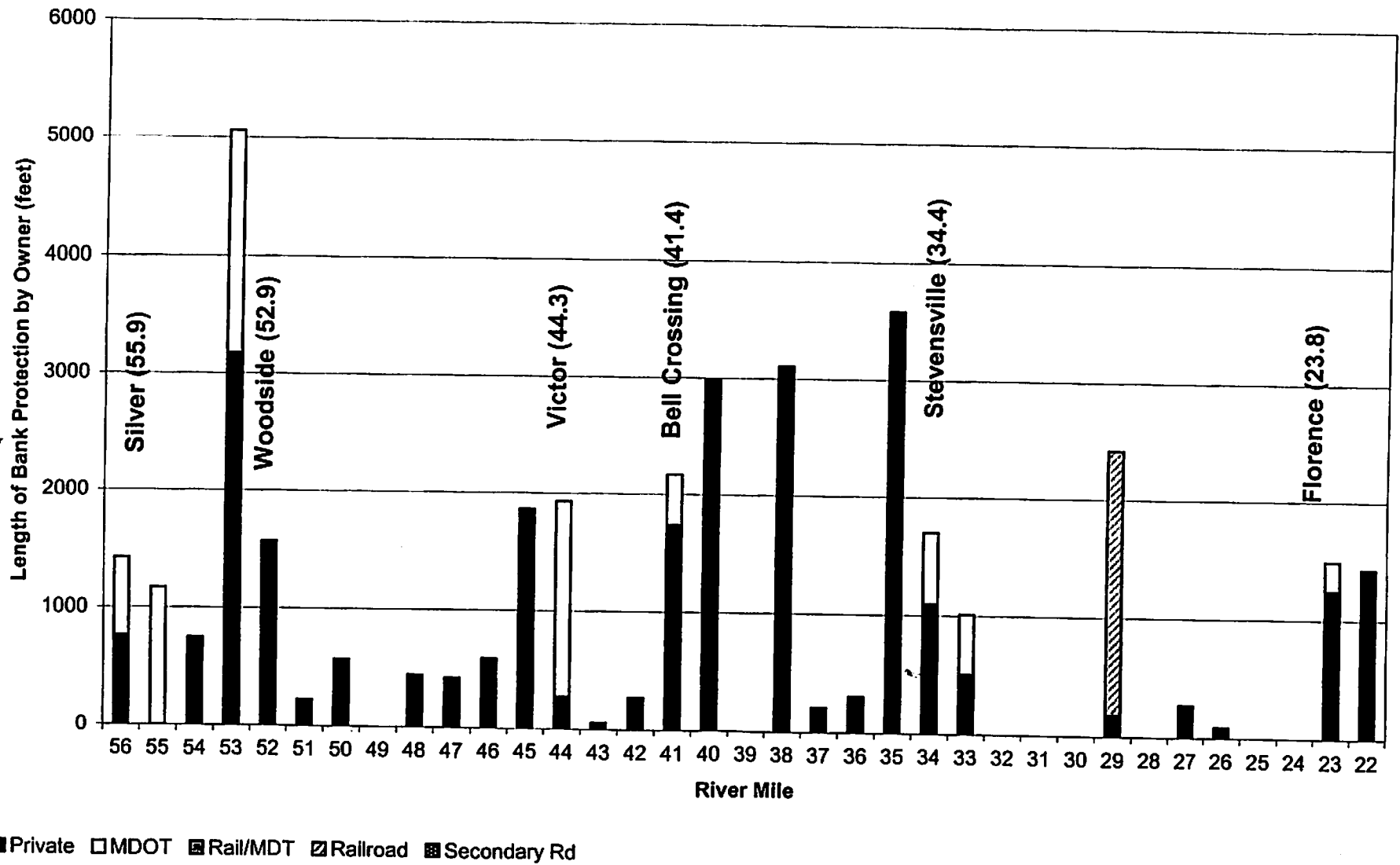


Figure 4B. Total inventory and relative distribution of bank protection along the main stem of the Bitterroot River, categorized by responsible party.